



Research Article

AN INSIGHT TO THE PHARMACOGNOSY OF *SHATAVARI* (*ASPARAGUS RACEMOSUS* WILLD.)

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ABSTRACT

Asparagus racemosus Willd. (*Shatavari*) belonging to the family Asparagaceae is a drug well known since ages. It is regarded as the queen of herbs. *Shatavari* is not only a potent medicine but is also used as a vegetable in many parts of the world. The therapeutic applicability of the drug extends from aphrodisiac, galactagogue, diuretic, tonic, styptic, antibacterial, and antimycotic. In the Ayurvedic samhitas, there is repeated mentioning of the drug in the treatment aspects of Rakthapitta (bleeding disorders), *Sthanyavardhaka* (galactagogue), *Rakshoghna* of *Vranitha* and *Soothika* (antimicrobial activity), and in *Mutrakrchrakitsa* (urinary disorders). This work aims at understanding the organoleptic features, microscopic details and powder microscopy of the tuberous root powder of *Shatavari* (*Asparagus racemosus* Willd.). Even though the drug *Shatavari* is well known and used widely, detailed studies regarding the microscopic characters and the powder microscopy has not been documented in detail covering the entire aspects. In the light of authentic Pharmacopoeial texts, the cell constituents of the sample has been analysed and the powder microscopy also revealed the presence of calcium oxalate crystals, pitted vessels, tracheids etc, which also affirms the genuineness of the source drug *Shatavari*. Yet another concern is with the widespread use of adulterants. *Shweta musali* (*Chlorophytum borivilianum* L.) is used instead of *Shatavari* at many places knowingly or unknowingly. Hence a thorough understanding of the genuine drug in terms of its microscopic as well as powder character is very much essential to prevent the adulteration as well as providing a key to the identification of plant source.

KEYWORDS: Pharmacognosy, *Shatavari*, Macroscopy, Microscopy, Powder microscopy, Adulterants.

INTRODUCTION

Shatavari (*Asparagus racemosus* Willd.), belongs to the family Asparagaceae. According to National Medicinal Plant Board, 2003 the demand for *Asparagus racemosus* was 10,924.7 tonnes in 2001–2002 which was increased up to the level of 16,658.5 tonnes in 2004–2005 indicating the annual growth rate of its demand is 15%.^[1] Earlier the *Asparagus* species were included in the Liliaceae family, whereas the APG-3 system 2009, proposed 7 subfamilies to be included in a newly formed family, Asparagaceae.^[2]

The drug is mentioned since the time of puranas. There is mentioning in *Agnipurana* regarding the *Rakshoghna* property and used in *Homas* (rituals). In the *Samhitha* period a detailed description of the drug in terms of its therapeutic properties and its extensive use in the treatment of *Streeroga* (gynaecology), *Vrana* (surgical wounds), *Rakthapitta* (haemorrhage) *Mutrakrchr* (urinary disorders), *Vajeekarana* (aphrodisiac), *Rasayana* (immune stimulant) etc., are available.

The plant is indigenous to tropical India and quite commonly seen in provinces from sea level to about 1400 m elevation. It grows well under a variety of soil and climatic factors. It is an extensively branched, scandent or spiny twining under shrub straggling over hedges and bushes or occasionally climbing to great heights on tall trees. Root stock is stout and short and bears numerous considerably long, fusiform succulent tuberous roots. Seasonally one or more shoot are formed from the root stock. Roots are perennial, many, fascicled, 30cm long, smooth tapering at both ends, succulent and tuberous. Stem is scandent twining armed with strong straight or recurved spines at the nodes and woody when mature. Branchlets are angular. Leaves are reduced to minute chaffy scales or spinescent and subtending leaf-like cladodes. Cladodes are dark green divaricate falcate triquetrus or very slightly compressed and channeled beneath, 10 -25mm long and about 2mm wide. Inflorescence is borne in axillary clusters of 2-6, short, simple, few or many flowered racemes. 2.5 – 8cm long which are either

solitary or more often in crowded fascicles of 3 or more arising from the nodes of main shoot or in the axils of the thorns on slender woody branches. Flowers are numerous and small, 3-4mm diameter. Bisexual, whitish and very strongly and sharply scented, or rather an irritating odour. Fruits are globular or more often obscurely 3 lobed pulpy berries 4- 7mm diameter, of which one or two are

bigger. They are green and shining when young but turn red when ripe and contain seeds 2 or 3 in number. Seeds are thin but hard and brittle testa, which is white and then turns black in colour. A horny or cartilaginous endospermis present. Embryo is dorsal transverse and curved in a serpentine manner in the back of the endosperm and nearly opposite to the funiculus.^[3]



Figure 1. a) whole plant of *Shatavari* b) stem, c) roots, d) leaf, e) unripe fruits, f) ripe fruits, g) seeds

Materials and methods

a) Macroscopic study of tuberous roots

Preparation of sample: The part used was the tuberous root of *Shatavari* (*Asparagus racemosus* Willd.), which was collected freshly from the market and washed thoroughly to remove soil and debris.

Method: The macroscopic characteristics of fresh sample of the drug was studied using organoleptic methods.

b) Microscopic characters

Preparation of sample: The part used was the tuberous root of *Shatavari* (*Asparagus racemosus* Willd.), which was collected freshly from the market and washed thoroughly to remove soil and debris.

Method of study: One tuberous root was selected and uniform, fine sections were taken using new blades. Thin sections were selected, stained using Safranin stain, then placed over clean glass slide and covered with clean cover slips. The slides were observed under the microscope under different magnifications and the cells were identified.

c) Powder Microscopic characters

Preparation of sample: For powder microscopy, a pinch of the powder of the sample drug was taken in a clean, dry glass slide and a few drops safranin stain was added to it and then a uniform smear was taken using the sharp edge of another glass slide. The thin smear obtained was dried and viewed under the microscope under different magnification and the cells identified were focused and the photos were taken.

Results

a) The macroscopic characteristics were analysed by organoleptic method the fresh tubers are finger shaped, fleshy. Externally brown in colour, with wrinkles and occasional tiny root hairs present. The inner surface is creamy white and starchy with a hard central cork. Thermascopic features are summarized in table 1.

Table 1: Organoleptic evaluation of tuberous root of *Shatavari* (*Asparagus racemosus* Willd.)

Shape	Fleshy tuberous and narrowly tapering on both ends
Size	10 – 30 cm in length and 0.5 – 1 cm width.
Colour	External surface – light brown in colour. Internal surface – creamy white
Texture	Outer surface- rough with long longitudinal wrinkles, occasional small root hairs Inner surface – starchy
Odour	Characteristic odour
Taste	Sweetish, slightly bitter
Fracture	Short

**Figure2. Fracture of tuberous root of *Shatavari* (*Asparagus racemosus* Willd.)**

- b) Microscopic analysis of the tuberous roots shows an outer layer of piliferous cells, ruptured at places and unicellular root hairs seen occasionally. The outer cortex consists of 6 or 7 layers of polygonal, thick walled, lignified cells and the inner cortex comprised of 20 to 23 layers of oval to polygonal, thin-walled cells. Stone cells, and raphides of calcium oxalate were also present in this region. 2 or 3 layers of stone cells are seen encircling the endodermis which is composed of single layer of thin-walled parenchymatous cells. Pericycle is present below endodermis as a single layer of compactly arranged cell. The Stele is Ex arch and radial in position. Xylem - consist of vessels, tracheids and parenchyma; xylem vessels have pitted thickening. Phloem as patches seen alternating to the xylem vessels. Pith is composed of circular to oval parenchymatous cells. The microscopic view of the tuberous roots at 10 X and 40X magnification is shown in figure below.

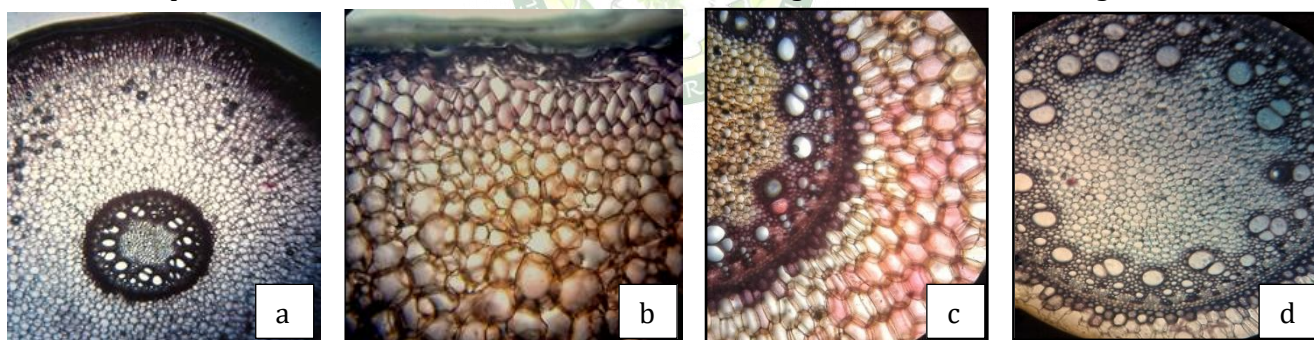


Figure 3; a) cortex and stele in 10X, b) outer and inner cortex at 40 X, c) inner cortex, layer of stone cells, endodermis and portion of stele, d) pith with the ex-arch and radially arranged xylem and phloem.

- c) Organoleptic characters of powder of the tuberous root revealed slightly brownish colour, rough in textue, odour characteristic and sweetish with slight bitter taste. It was sparingly soluble in water. The figure below shows the nature of powder of tuberous roots of *Shatavari*.

**Figure 4: Powder of tuberous roots of *Shatavari***

Powder microscopy revealed presence of acicular crystals, raphides of calcium crystals, pitted vessels, tracheids etc., which are given in the figure below.

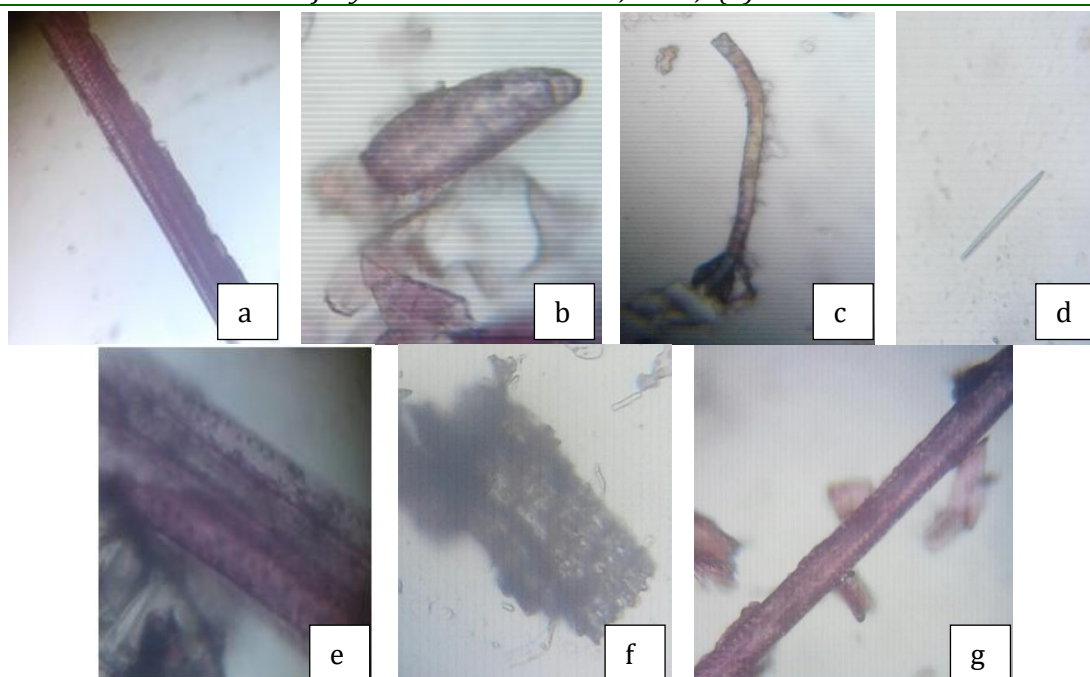


Figure 5: a).Vessels, b). Parenchyma, c). Tracheid, d). Acicular crystal of Calcium oxalate, e). Pitted parenchyma, f). Raphide bundle, g). Pericycle fibre

DISCUSSION

The findings coincided with the description of *Asparagus racemosus* Willd., available in the Ayurveda Pharmacopoeia of India as well as the schematic representations available in the text book of Pharmacognosy. The cell constituents identified under the powder microscopy was similar to that available in the International journal on Pharmacognosy. The characteristic features such as acicular crystals, raphide bundles, pitted vessels were evident from the study.

CONCLUSION

The findings drawn from the study substantiates the genuineness of the drug *Shatavari* (*Asparagus racemosus* Willd.), which is in par with the authentic descriptions available in the authentic books. The data obtained adds to the existing details available so far. These findings can be used as a reference aid and can be helpful in identification and differentiation of market available adulterants.

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